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THE EXCAVATING ENGINEER PUBLISHING COMPANY

FRANK G. BOLLES, Manager and Editor BRADLEE VAN BRUNT, Assistant Manager

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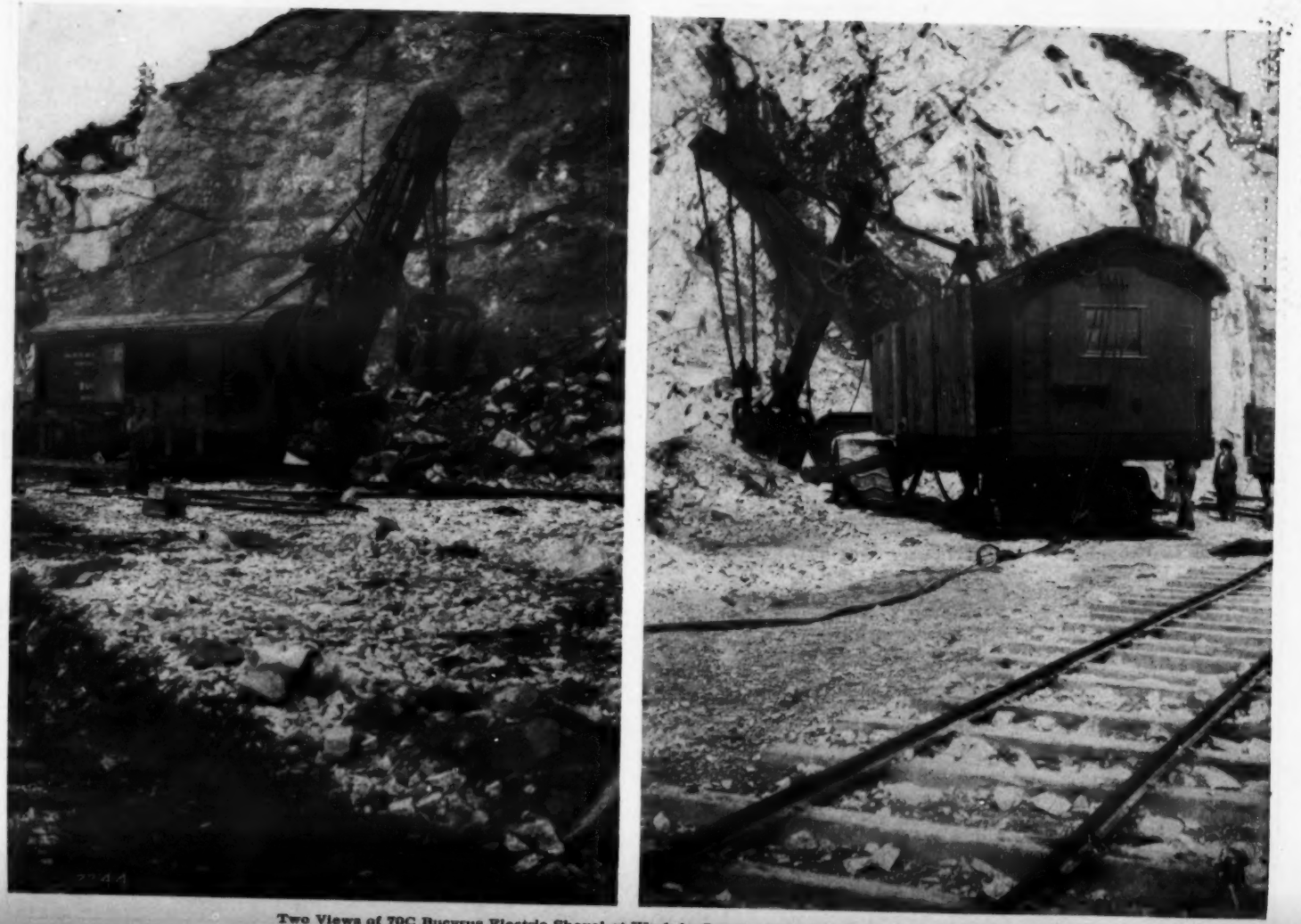


Two Views of 70C Bucyrus Electric Shovel at Work in Granite Quarries, Burrards Inlet, B. C.

An Electrically Operated Shovel

By H. Hertz

IT is quite logical that electric power should have found its way into the field of excavation. It has been applied to hundreds of different lines of industry with entire success. In fact, electric power is ideal for most purposes and may be accredited with large savings in the power bill in practically every installation. There are few places where steam power is used that cannot be better and more economically served by electricity.

These facts were recognized several years ago by the Bucyrus Company, of South Milwaukee, Wisconsin, whose steam shovels have dug more than 75% of the millions upon millions of cubic yards of earth and rock removed in the building of thePanama Canal and they have pursued a careful study of the problem of the electrification of excavating machinery, embracing dredges, draglines and shovels with the result that they are now offering these machines as a standard line of their products.

A general description of the more important details of construction of the Bucyrus electric shovel, will probably be of interest to our readers, those of the electric dragline being reserved for a later article.

As in the Bucyrus steam shovel, the greatest possible care is exercised in the selection of proper material for the various parts of the electric machine, the mere statement that a part is of cast steel or cast iron or structural steel, means little, as there may be vast differences in castings of steel or iron or in the composition of structural material, and the Bucyrus Company, through its long experience in the building of excavating machinery has for years maintained its own chemical and testing laboratory. In this laboratory its expert chemists and testing engineers critically analyze the metal of every heat poured in its steel and iron foundries and finally test in various ways the metal used for every part.

All basic open hearth steel castings must have a tensile strength of 75,000 pounds per square inch with an elongation of 25 per cent, and all structural material is of basic open hearth steel and tested according to the latest requirements of the American Society for Testing Materials, and is carefully inspected before leaving the mills. Thus, in Bucyrus machines, all gears are annealed basic open hearth steel castings, except the shipper shaft pinions and dipper handle racks, which are manganese steel on all except the smallest shovels. Sheaves are annealed steel castings, bronze bushed, with grooves accurately turned. Shafts are large and of hammered steel while cables are of extra flexible plow steel.

The general dimensions of the 60-C Bucyrus Electric Shovel are as follows:

It has a clear lift from bottom of rail to dipper door when open, of 16 feet 0 inches; it will cut 54 feet 0 inches, in width at an 8 foot elevation; the length of car over all is 37 feet 3 inches and width is 9 feet 3 inches; the trucks are of the "Diamond" pattern and M. C. B. draft rigging is used both front and rear; there are two propelling chains actuating front and rear axles; the dipper has a capacity of 2½ cubic yards.

The carbody is built up with four heavy "I" beams having structural cross connections at the ends. Heavy cast iron separators are placed at intermediate points for rigidity and wherever neccessary for carrying machinery. All cast iron separators have planed ends to insure proper fit against I-beams. Rod bolts pass through car sills and drilled holes in the separators and serve to rigidly tie the carbody together. The body is heavily plated which further adds to its strength.

An important feature of Bucyrus shovels is the main base plate which is made of a single casting of annealed basic open hearth steel, having connections for the A-frame feet and jack arms, and at its front end, the pintle or step bearing which carries the swinging circle. The base plate carries on its under side the base plate sheave which is an annealed steel casting with bronze bushing and finished groove. The seat to which the shaft of this sheave is bolted, is so designed that the resultant forces on the sheave are normally transmitted to the seat. Lubrication is effected from the floor of the shovel.

The front car bolster is a basic open hearth annealed steel casting, extending entirely across the car, and containing center and side bearings, and three point bearings to take the tension from jack arms. It has an upward extension between the inner car beams, abutting against and securely bolted to the main base plate. Bored transverse holes are provided at each end for the attachment of the folding jack arms hereinafter described. Heavy cast iron separators accurately fitted between the outside and inner car beams fill up the space between the main base plate and car bolster.

The main base plate, car bolster and car separators are securely bolted to each other and to the car beams, making a construction that is absolutely rigid and in every way adapted to take the loads coming upon it. All bolts subject to shear are fitted, and all bolts subject to tension are of large size for the work.

The A-frame guy attachment is made of an annealed basic open hearth steel casting securely

Upper Picture Shows Panoramic View of Work on Lahonton Dam, U. S. Reclamation Service, Lahonton, Nevada. Lower Picture is a Near View of the 60C Bucyrus Electric Shovel and Class 14 Bucyrus Electric Dragline Shown at Left in Upper Picture.

riveted to a structural steel girder, carrying on its lower side the rear truck center plate. This girder is continuous from side to side and is designed to take both the horizontal and vertical forces. The inner car-beams abut against the girder and are securely riveted to it.

The cab is substantially built, having a structural steel frame with ¼″ steel roof plates.

The trucks are all steel of the Diamond frame type, with 33″ wheels and 4¼″x8″ journals. All parts are standard M. C. B. construction except the axles which have a machined bearing for the split propelling sprockets. The driving wheels are keyed as well as pressed upon the axles.

The bolster is of the box girder type with annealed cast steel center bearing. It is supported upon 12 heavy M. C. B. springs. Both forward and rear trucks are provided with air and hand brakes.

The A-frame is constructed of two solid billet members, of large dimensions, which are attached to the base plate by fitted pins. The A-frame head is an annealed basic open hearth steel casting with sockets in which the A-frame legs are seated. . The legs are fastened by both pins and heavy clamps bolted to lugs on the casting.

General View of Granite Quarries Located at Burrards Inlet, B. C.

The A-frame pintle is of large dimensions and provided with an oil reservoir with dust proof cover. A shoulder on the upper end of the pintle prevents the collar from slipping off. The collar is a heavy trussed casting of basic open hearth steel so designed as to transmit both horizontal and vertical forces. The boom guys are attached by pins and the collar bearing has a heavy cast iron bushing. All lines of stress in the A-frame interesect at one point, thus eliminating all stresses except direct tension and compression.

The swing circle is built of structual steel and is mounted upon a center casting of annealed basic open hearth steel. This casting has a heavy cast iron bushing machined to fit the base plate pintle, and sockets to receive the boom feet. Heavy angle irons, mounted back to back, extend across the top of the circle to which they are securely bolted through filler blocks. The latter are, in turn, anchors for the adjustable side braces for the boom and for the pin-connected diagonal tie bars which extend to the bottom of the center casting. Heavy web plates are riveted to the rim and to angles which in turn are rivited to the center casting, the whole forming a continuous web across the swing circle. One section of the swing circle is removable for inserting the boom. Screw take-ups are provided for taking up the slack of the swinging ropes.

The jack-arms are single steel castings with solid web and heavy flanges. The connection to carbody is made by an upper conical bearing, so designed that it cannot slip out of place, and a lower connection through a cast steel yoke with double attachment to car bolster. The design permits of swinging the jack-arm either way against the carbody, the only parts to be disconnected being the side braces. The jack screw nut is a separate casting and may readily be replaced.

The hoisting drum, which is of heavy cast iron construction, is fitted with two housings, one for the lowering brake and the other for the hoisting band. The drum is provided with long bronze bushings and runs loose on the hoisting shaft. The cast iron housings are securely fastened by

70C Electric Shovel, at Granite Quarries, Ready to Dump into Car

fitted bolts. The drum shaft is of hammered steel with babbitted bearings and the hoisting gear is an annealed basic open hearth steel casting with cut teeth. The hoisting friction, which is of the outside band type, is operated by an air thrust cylinder, making operations smooth and easy. All clutch mechanism parts are either forgings or heavy steel castings, all pins being accurately fitted and arranged for oiling. The lowering brake is operated by a counterweighted foot treadle. Hoisting and lowering bands are lined with basswood blocks.

The propelling mechanism is supported from the under side of the inner car beams and consists of a hammered steel shaft running in bronze bushed cast steel boxes and carries the sprocket wheels which connect by chains to the rear axle of the front truck and the forward axle of the rear truck. The propelling shaft is connected by gears to the drum shaft through a machined jaw clutch. The chains are of the pin and bar type which effectively grip the sprockets under all conditions.

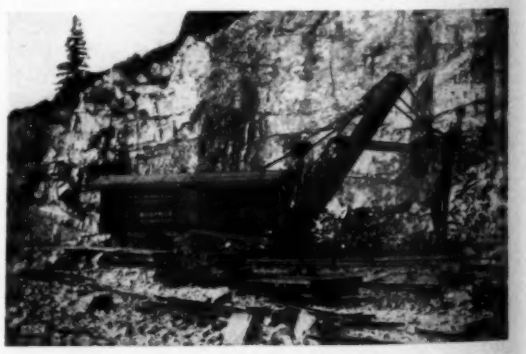
The machine grooved swinging drum is attached to the driving gear by fitted bolts, the shafts being mounted in heavy cast iron babitted bearings securely bolted to the car beams. The swinging idler sheave is mounted on an annealed basic open hearth steel casting stand, which is also bolted to the car beams.

The boom is of the Bucyrus combination wood and steel type which has proved most effective under all classes of work and conditions. It consists of two paralled seasoned hardwood timbers heavily reinforced at the edges with angle irons and bars. The chain sheaves, which are of large diameter are annealed open hearth steel castings with long hubs, bronze bushed and lubricated by either grease cups or through the shafts. The shipper shaft is made of a hammered steel forging, the bearing for gears and pinions being made square to provide for easy removal of these parts.

The saddle block is a heavy iron casting and cap with a large steel casting slide. The saddle block slides on a flat bar mounted on top of dipper handle and is provided with liners between slide plate and yoke. The U-bolt is of heavy round ulster iron with nuts securely locked.

The dipper handle is built of two side timbers with top, bottom and side bars, the latter being rivited through and through. The top and bottom bars, and manganese steel racks, which are heavily shrouded to the pitch line, are secured by bolts. A timber dead wood is fitted to the lower end of the handle and held in place by bolts which pass through the main timbers and side plates of the handle. The handle is attached to dipper by heavy steel castings held in place by bolts of large diameter.

The dipper, which has a capacity of 2½ cubic yards, has four teeth. These are either manganese steel of the Panama type, or steel forgings with tool steel points, whichever is best adapted to the work. Three sides of the dipper shell is of heavy



Another View of the Granite Quarries Machine

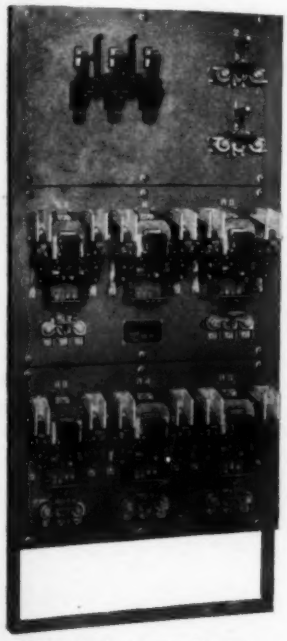
steel plate stiffened at its lower edge by a heavy band. The dipper bail and back braces are attached by means of heavy steel castings rivited to the side plates. The dipper hinge and handle connections are provided by a very heavy steel casting riveted to and extending across the entire back. The heavy one-piece door is supported on cast steel hinges with renewable bushings of hardened steel.

Compressed air is supplied by a motor driven compressor with reservoir, governor and automatic unloading device.

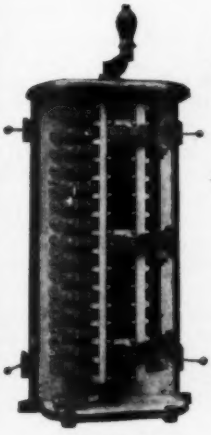
Motor equipment may be either alternating or direct current. The hoist motor is double geared to the hoisting drum, the friction being identical with those used upon steam operated machines. The clutch is controlled through the medium of an air thrust cylinder operated by hand lever.

The hoist controlling apparatus is of the multiple solenoid type, the operation being effected through a master controller. The solenoid switches are mounted upon a slate panel having a structural steel frame. Circuit breakers and overload coils protect the motors from injury. The resistance elements are cast iron grids mounted similiarly to those used in electric railroad service. The master controller provides for six speeds of the motor and the operator can dig on any of these speeds. He can, however, throw the master controller immediately to the full speed position without danger of injuring the motors because the solenoid switches will automatically keep the current down to a pre-determined value and cut out resistance only as the motor speeds up. If the shovel becomes stalled due to heavy digging the main circuit breakers will not fly out but instead jamming relays will automatically cut resistance into the motor circuit and will allow only such amount of current to flow to the motors as will permit them to exert their maximum torque without injury. This method of control gives the electric shovel the same digging characteristics as has the steam shovel and makes the operation of the two machines practically identical.

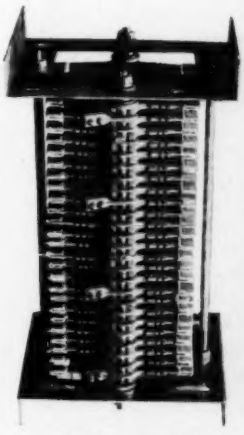
The swing motor is geared to the swing drum through an intermediate shaft, its controller being of the series relay reversible type. These relays and all necessary switches and circuit breakers are mounted upon a slate panel similiar to that for the hoist motor. The controlling apparatus provides for a uniform acceleration of the motor, when the operator throws the master controller direct to the full speed position, and is so designed as to prevent shocks and jars to the machinery. In stopping the swing motor the operator may throw the controller from the full speed forward to the full speed reverse position, but the motor will be retarded at a uniform rate through the action of the relays. On the other



Swing Motor Control Panel



Motor Controller with Cover Off



Grid Resistance

Hoist Motor Control Panel

hand this control enables the operator to swing as slowly as desired and to stop the swinging motion abruptly, thus avoiding loss of time in spotting the dipper over the cars in loading.

The design of the soleniod switches is characterized by the element of simplicity and safety, having few wearing parts, which insures long life.

The thrust motor is also of the variable speed type, similar to the hoist and swing motors, but enclosed and ventilated. The windings are absolutely moisture proof. It is connected to the shipper shaft through intermediate gears of cast steel with teeth cut from the solid. On the intermediate shaft is an air operated friction clutch so designed that it will slip when the torque reaches a value less than the stalling torque of the motor by a certain predetermined amount. The slipping friction clutch protects the motor from severe overloads and a brake also on this shaft may be used for holding the dipper and handle in certain positions when digging at a fixed radius. This, of course, means considerable saving of electric power. The brake clutch may also be used for quick manipulation of the dipper, whereby a condition, approximating the shaking of the dipper by a steam engine, is established.

The details of construction of the various controllers follow the lines which have for some years been standard with street railways and other lines of severe service and have proved entirely satisfactory. The designs, however, are special for this service, and, after more than a year in actual service have demonstrated the correctness of principles involved.

The wiring is weather proof, heavily insulated and run in metal conduit wherever possible.

It is but a logical conclusion that electric lighting should be used and it affords a most convenient means of examining the machinery when necessary. Search lights are an easily added and valuable adjunct for night service. In fact electric lighting is as ideal for shovel work as for the innumerable other fields in which it is now supreme.

Within the year just passed the BucyrusCompany has placed on the market and have orders for six different types of electrically operated machines, most of which are now in successful operation.

Their first electrically driven machines have been in actual operation for more than a year and are recognized as successful from whatever angle they are viewed.

One of the first electrically operated draglines was used by the United States Reclamation Service on the big Lahonton Dam which is part of the Truckee-Carson Irrigation Project. This dam is located about seven miles south of Hazen, Nevada, on the Southern Pacific Railroad, and 75 miles east of Reno, in a territory known as Carson Sink. This wide barren valley is the bed of an ancient river. It is flanked on the east, north and south by desert hills and on the west by the Sierra Nevadas, rising to a height of 11000 feet above the sea. The Carson River, having its origin in the Sierra's, flows into the Carson Sink, which, during spring floods, becomes a lake, to entirely disappear in late summer leaving a great bare alkali flat known as Forty Mile Desert.

It is in this region that a great irrigation project is being carried out and which will cost the United States Government several million of dollars.

Lahonton Dam, which alone will cost $1,500,000 will impound sufficient water during the flood period to irrigate more than 200,000 acres of soil consisting of clay, loam, volcanic ash and sand loam.

In completing this work it will require the moving of 425,000 cubic yards of material to be wet and rolled and 225,000 cubic yards of gravel.

Electric power is secured from a plant specially built for this work by the United States Reclamation Service, having a capacity of 1250 K. V. A. Pelton-Francis wheels are used to drive alternating current generators which were supplied by the General Electric Company. The current is generated and transmitted at 2300 volts and then transformed to 440 volts for use on the machines.

Two electrically driven machines are used on the work at Lahonton Dam, one being a Class-14 drag line with 60 foot boom and originally equipped with a 1½ cubic yard bucket, which was later changed to a 2 cubic yard bucket, and a 60-C, the latter being described in this article. Both machines were made by the Bucyrus Company, of South Milwaukee, Wisconsin.

The transformers for the dragline were mounted upon skids and located near the machine, the low voltage current being carried to the motors by means of flexible cables.

The dragline was at first used to strip silt and soil which formed the wetted and rolled portion of the dam. Later, and until the arrival of the 60-C shovel, it was used for digging gravel which was loaded into 4 yard cars for distribution over the work. The machine handled 75 to 80 cubic yards per hour.

Early in the Spring of 1912 the electric shovel arrived and has since been used in loading gravel with entire success. The transformers for this machine instead of being mounted upon skids were installed in the cab.

On the front cover of our January issue we show a view of the 70-C Bucyrus Electric Shovel supplied to the Granite Quarries Ltd., of Vancouver, B.C. Prior to the introduction of this machine 40 laborers were used for loading the rock at a cost of $120.00 per day. The shovel has a guaranteed capacity of 800 yards and will easily handle 1000 yards under competent management.

One important feature of these electrically operated machines is the fact that the operating levers are the same as for steam shovels. Thus the old steam shovel runner is enabled to handle successfully the modern electric machine without difficulty.

One 100-C Bucyrus electric shovel has just been shipped to the Loussavaara-Kirunavaara Mining Company, in Sweden. This machine, like the Granite Quarry's 70-C, is to be operated by alternating current motors made by the Westinghouse Electric & Mfg. Co. They are of the three phase, 25 cycle, 440 volt type. The reducing transformers are located in the cab of the shovel.

From many tests on 60-C and 70-C shovels, the economy of operating has proved better than was anticipated and under average conditions with fairly easy digging the 60-C will use 600 K. W. H. for an eight hour working day while the 70-C in blasted rock will require 700 K. W. H.

A series of tests were conducted on the 60-C shovel at Lahonton Dam, Nevada, from the first to the 11th of September, 1912. During the test the shovel was loading cars at the rate of 2¾ cycles per minute. We give below an analysis of several of the runs made:

TEST No. 1.

The shovel was loading into two trains composed of 6 four yard cars.

Started at 7:00 A. M. Stopped at 10:49 A. M.
Bank 10 feet. Clear lift to dump 16 feet.

Train No.	Number Dippers	Actual Time Loading		Time Moving Up		Time Waiting for Cars	
		Min.	Sec.	Min.	Sec.	Min.	Sec.
1	11	3	30	9	40	.....	.....
2	12	4	25	7	30	4	12
3	13	4	00	4	30	3	50
4	13	4	50	7	35	1	55
5	10	3	10	6	10	3	10
6	10	3	30	4	25	3	00
7	12	4	20	.....	.....	2	20
8	13	5	06	3	40	2	15
9	13	5	05	4	55	2	55
10	13	4	25	.....	.....	4	14
11	11	4	40	4	05	4	00
12	12	4	15	.....	.....	3	20
13	12	4	02	.....	.....	2	30
14	13	4	50	4	35	3	50
15	12	3	50	.....	.....	3	45
16	14	4	25	.....	.....	4	30
17	12	4	45	4	35	3	48
18	12	4	10	.....	.....	4	15
19	12	4	25	.....	.....	5	40
20	12	4	33	3	30	7	40
21	12	4	48	.....	.....	2	49
Total	254	90	4	65	8	73	59

Total elapsed time three hours and 49 minutes.
Error in time observations 11 seconds.

Delays in shovel operation proper are included in "Actual time loading".

During 3 hours 49 minutes, 126 cars were loaded and 254 cycles were made. The actual time of loading was 39.6 per cent of the total time while the delays amounted to 60.4 per cent. The shovel was loading at the rate of 2.8 cycles per minute.

On the basis of above proportions of actual digging time and delays the shovel would show a total capacity in eight hours of:

$\frac{480}{229}$x126x4 equals 1058 cubic yards.

TEST No. 2.

Started 12:41 P. M. Stopped 1:31 P. M.

Train No.	Number Dippers	Actual Time Loading		Time Moving Up		Time Waiting for Cars	
		Min.	Sec.	Min.	Sec.	Min.	Sec.
22	12	4	20	.....	.....	.....	.....
23	12	4	17	3	25	2	50
24	12	4	15	.....	.....	2	59
25	12	4	05	.....	.....	13	50
26	13	4	42	2	25	2	54
Total	61	21	39	5	50	22	33

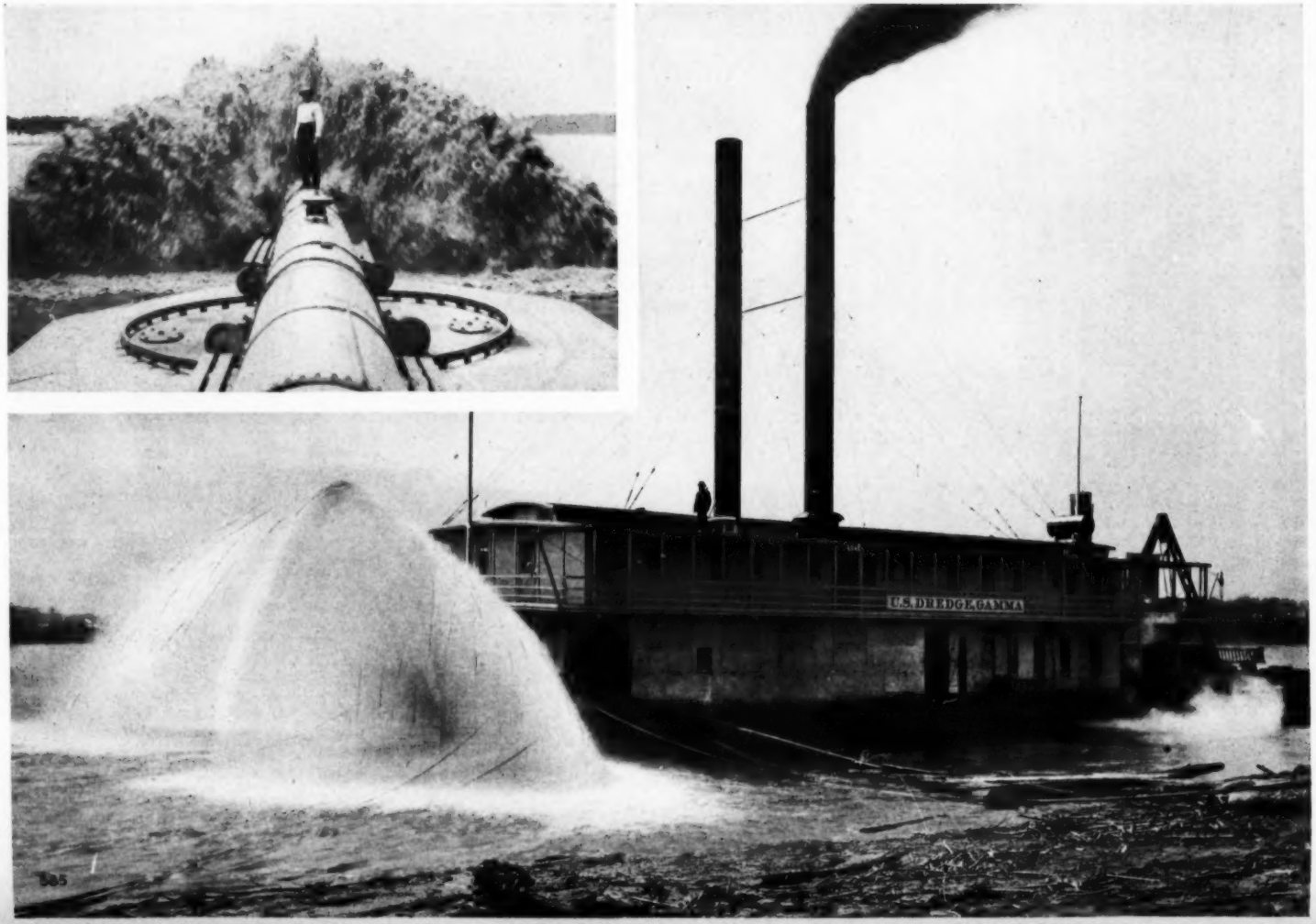
Total elapsed time 50 minutes.

In this test the shovel loaded at the rate of 2.82 cycles per minute, the actual loading time being 42.5 per cent of the total elapsed time, while the delays were 57.5 per cent. The capacity of the shovel on this test, would be 1150 cubic yards per eight hour day.

On the basis of two yards per cycle, 8 hours per day, 57 per cent digging time and 43 per cent for delays, which were shown by the numerous tests made to be a fair average with present conditions, the shovel capacity would be 1500 cubic yards. However, with improved loading facilities the delays could be materially reduced and the output increased.

Mr. Herman J. Slifer has opened an office as consulting engineer, specializing in steam railroad practice, at 925-27, 209 La Salle St., Chicago, Ill.

Mr. Slifer is a member of the American Society of Civil Engineers, American Railway Engineering Association, American Institute Consulting Engineers, and Western Society of Engineers. He has had an extensive railroad experience covering a period from 1878 to date.



U. S. Dredge "Gamma" in Action. The Action of the Water is due to a Baffle Plate. The Small View is taken from the Dredge Deck.

Self Propelling Hydraulic Dredges "Kappa" and "Henry Fladd"

By A. B. Stetson

OUR illustrations show two self propelling hydraulic dredges named "Kappa" and "Henry Fladd", built by the Bucyrus Company for the United States Government under a contract with Captain Mason M. Patrick, Corps of Engineers, U. S. A., and secretary of the Mississippi River Commission, St. Louis, Mo. They were delivered to the government at Cairo, Illinois, to which point they went under their own steam from St. Louis, where they were erected.

The contract requirements were as follows: The digging of a channel 30 feet wide and 15 feet deep and depositing the material 1000 ft. away from the stern of the dredge, through a 32 inch floating discharge pipe, at a rate of not less than 1000 cubic yards per hour.

The equipment, which embraced everything from machinery to dishes, was sufficient for three crews so the dredge could be operated continuously. This necessitated furnishing quarters for sixty men. These were located on the upper decks and were provided with hot and cold water, steam heat, electric lights, etc. The kitchen and dining rooms were furnished with all necessary cooking utensils, china, glassware, linen, etc. to accomodate the whole crew at one time, if necessary.

The hulls, which were of steel throughout, were of the following dimensions:

Length molded	192′	Width molded	44′
Depth molded	7′	Width at bow	32′
Width at stern	34′	Width over guards	75′
Length of well	33′	Width of well	25′

They were framed on the transverse system with six transverse bulkheads and two collision bulkheads in the wings, and four longitudinal truss frames. Draught of water when fully equipped was 48 inches.

The hulls were each fitted with two hauling ahead winches, having double engines with cylinders of 7″ bore and 7″ stroke geared 412 to 1. The hauling drums were 48″ diameter grooved for 1″ wire rope, and long enough to wind 1200′ in one lay.

Three double barreled steam capstans were provided, two for the forward deck, and one for the stern. These capstans were driven by engines having 7″ bore and 8″ stroke.

The steering of the boat was accomplished by means of a steam steering engine and, also, by a pilot hand wheel. These were so arranged that either could be used separately, the change from one to the other being very quickly made. All necessary bitts, chocks, cavels, bilge siphons, fairleads and ring bolts for snatch blocks and deck hatches were furnished.

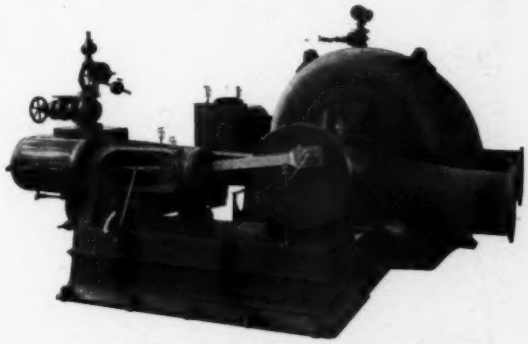
Dredging Machinery

The main pumps were of the centrifugal, double suction type and have two suction pipes, each 22″ square, and one 32″ discharge pipe. The pump runners were of steel 84″ in diameter with five blades. The pump casings were divided horizontally through the axis of the shaft. The top halves were again divided vertically, and put together with machined joints. The casings were very heavy and fitted with steel liners throughout. All joints of liners were machined and fitted together as carefully as possible.

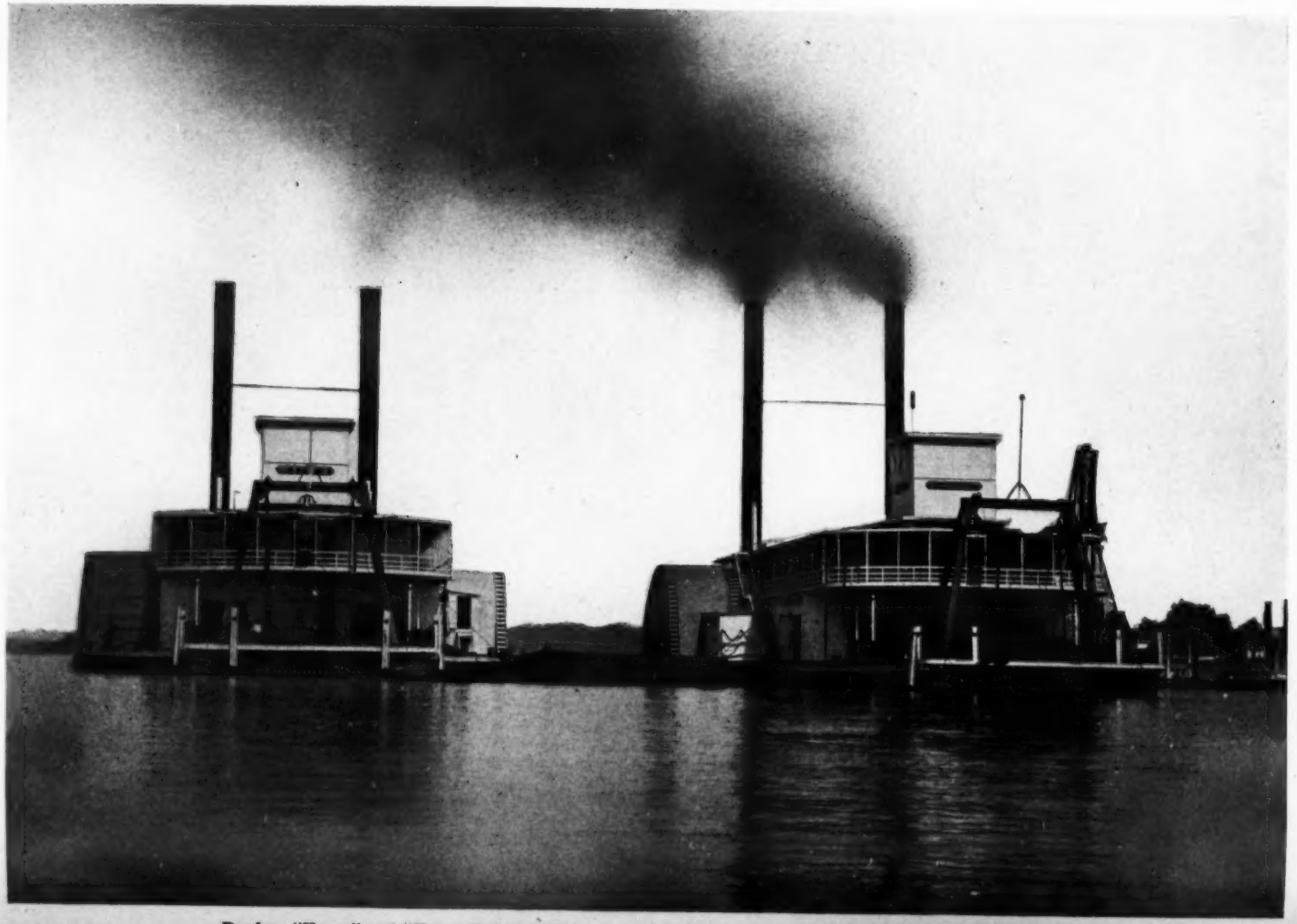
All fittings which go on the pump shaft were in halves with faced joints and put together so that no leaks would occur. The pumps were provided with 4″ steam operated air exhausters for priming the pump. The pump shafts were of forged steel 10″ diameter and 12″ long, oil tempered and annealed. Steel couplings were keyed to each end to connect with couplings on the crank shafts of the engines.

The main engines were twin horizontal tandem compound condensing, with cylinders 15″ and 30″ x 24″. The crank shafts have flange couplings on one end worked solid with the shafts. The engines were designed for heavy and continuous service at 155 R. P. M. and at a boiler pressure of 170 lbs. per square inch.

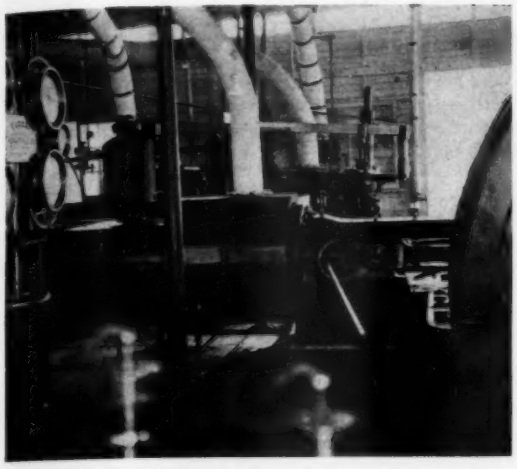
A balanced regulator or throttle valve, with a handle conveniently arranged for working the same, was placed between the engines. The steam pipes were led by easy curves from each side of the valve to the steam separators which were directly con-



Centrifugal Pump Driven by Twin Engines



Dredges "Kappa" and "Henry Fladd" Built for the United States Government Mississippi River Commission



In the Engine Room

nected to the cylinders. The drain from the separators was taken off by steam traps.

The condensers were of the independent jet type. The air pumps were duplex tandem compound with steam cylinders 10″ and 17″ diameter and water cylinders 19″ diameter and 15″ stroke. The water cylinders were brass lined and the pistons fitted with suitable packing. The pumps discharge into hot wells placed in the hold of the dredges which were fitted with steam-tight covers.

The mouth of the suction heads were 11′-6″ wide and 8½″ deep at the smallest part, and have flared entrances. The heads gradually contract until they are 22″ square inside, at which size they are continued to the bow and enter the hull by means of radial joints. Headers of 8″ standard pipe were placed on the under side of the suction heads, close to its mouth and were perforated with 12 holes tapped for 2″ pipe into which bronze nozzels, having openings of 1″ diameter, were screwed.

The pumps for supplying water to these agitator nozzels were of the horizontal duplex compound type with outside packed plungers. The steam cylinders were 10″ and 20″ diameter and the water cylinders 16″ in diameter by 15″ stroke. The pumps were required to work against 160 lbs. pressure.

Propelling Machinery

The engines were of the usual Mississippi river type, adapted for side wheels, each engine being connected separately to its own wheel. The cylinders were 22″ in diameter and 7′ stroke and were fitted with side pipes, valve boxes, valve and gear, drain cocks etc., and were covered with best magnesia nonconductor, and lagged with planished steel.

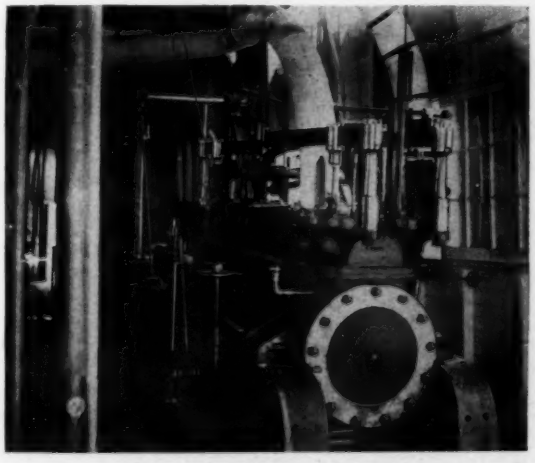
The piston rods were of hammered steel and the piston heads and followers were of steel castings; metallic packing was furnished for the piston rods.

The cross heads were made of steel castings with bronze gibs. The pitmans were 26′ long, built of lap welded steel tube with solid stub ends inserted, well trussed and fitted with braces. The crank and cross head ends were lined with best babbitt metal. The shafts and cranks were made of hammered steel and each engine was fitted with a balanced throttle valve. The engines were handled separately and were connected to separate paddle wheels, the latter being 22′ in diameter and each one 13′ long.

Steam Plants

There were seven main boilers of the usual Mississippi river type of 44″ diameter and 30′ long, each boiler having four flues of 11″ diameter. The shells were of Marine steel 3-10″ thick and 65,000 lbs. tensile strength. All holes were drilled and the longitudinal seams double riveted. The boilers were set in 3 separate batteries and had separate breeching chimneys, for each set. The boilers were built in accordance with the rules of the Board of Inspectors of Steam Vessels for a working pressure of 170 lbs. per square inch. Each battery was furnished with large steam and mud drums, and all necessary gauges, safety valves, blow off valves, etc.

The auxiliary boilers were of the vertical submerged flue type, 42″ in diameter, 9′ high with shell extended to form an ash pan. The shells were 3-10″ thick with a tensile strength of 65,000 lbs. They were furnished with all the usual boiler fixtures. All the boilers, steam drums, and steam pipes were covered with magnesia block which, in turn, was covered with canvas held in place by brass bands.



One of the Main Propelling Engines

Feed and Fire Pumps

There were two Blake horizontal duplex pumps with outside packed plungers 5″ diameter and 10″ stroke each having a capacity of 80 gallons per minute when running at average speed. These pumps had brass bushings in glands and stuffing boxes of water cylinders, and were provided with lubricators. They were arranged in such a manner that either or both could be used for feed or fire purposes, straight way valves being used in the connections. The suction pipes were connected to the hot wells and also arranged to pump direct from the river. A fire main was run on each side of the house with four branches on main decks, four on boiler decks and four on hurricane decks. Each branch was fitted with a valve and hose coupling for 2″ hose. Twelve lengths of 2″ rubber lined cotton hose each 50′ long were supplied, together with 6 nozzles and hose keys and rack for each branch.

These dredges are equipped with refrigerating plants, each having a capacity sufficient to make 1000 lbs. of ice per twenty-four hours and cool a storage room twelve feet long, five feet wide and seven feet high in the clear. The freezing tanks were provided with ice moulds, and filter.

Each dredge was provided with an electric light plant consisting of 15 horsepower engine direct connected to a multipolar generator of 110 volts and 10 K. W. capacity. A slate switch board was placed in engine room upon which was mounted an ammeter, voltmeter, rheostat, pilot lights and main switches, one each for main deck, cabin deck and arc and search light circuits. All wiring and fittings were in accordance with the rules and requirements of the National Board of Fire Underwriters.

One of the Large Centrifugal Pumps

Gasoline vs. Denatured Alcohol for Power Purposes

Apropos of the present shortage in the supply of gasoline, Bulletin 43 of the Bureau of Mines gives some interesting data concerning denatured alcohol as a possible substitute says Western Engineering. As a result of over 2000 tests conducted at the Government testing plants, it was found that, notwithstanding the low heating value of denatured alcohol, 10,500 British thermal units per pound as compared to 19,200 for gasoline, a gasoline engine having a compression pressure of 70 pounds, but otherwise as well suited to the economical use of denatured alcohol, will, when using alcohol, have an available horse-power about 10 per cent greater than when using gasoline. The relative compression pressure that can be used without causing pre-ignition is about 2½ times greater for denatured alcohol than for gasoline, while the maximum pressure was found in each case to produce the best results with regard to fuel economy. While gasoline requires twice the amount of air for complete combustion that is required by denatured alcohol, the heating value of one cubic foot of an explosive mixture of alcohol vapor and air is approximately equal to one cubic foot of a similar mixture of gasoline vapor and air. It is generally claimed that unlimited quantities of denatured alcohol can be obtained in all parts of the world at comparatively low cost, and although it is well understood that some types of gasoline engines are better adapted for the service for which they are intended than alcohol engines, there is an undoubtedly promising field for the development of an increased use of denatured alcohol for power purposes. Now that gasoline users are becoming restive under the pinch of high prices, the alcohol-driven engine may not be far distant.

The Excavating Engineer

[FORMERLY STEAM SHOVEL NEWS]

A Monthly Publication Devoted to Excavating *and* Allied Subjects

Contributions bearing upon the practical aspects of the above work are solicited, and if accepted will be paid for at the usual rates.

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Control of the Mississippi

It is the intention of The Excavating Engineer to invite contributions from those interested in the subject of the control of the flood waters of the Mississippi. In response to our invitation to write something upon the subject, we have a very interesting communication from Mr. N. J. Noble, of Noble, Alberta, which we print below.

We trust others of our readers who are interested in this greatest of all undertakings in this country, will contribute their views regarding the best methods to be pursued.

To the Editor of the Excavating Engineer,

I wish to thank you for your kind invitation to address you a communication on my ideas as to how the Mississippi can best be controlled and to offer a few suggestions in the hope that they may at least stimulate thought, and hence some live interest, on the part of my lay brothers. For in the good old United States we always have to reckon with the people, to take them into our confidence, and to educate them in the true spirit of brotherly helpfulness.

I take it for granted that we are to actually control this greatest of inland waterways and also that we have wisely decided to do this by the reservoir system as distinguished from any further hazardous attempt to depend upon higher levees and from that basely unworthy device of simply drawing off the flood waters through additional outlets. Surely, when we consider the fact that not a single advantage which we could possibly hope for under any system other than that of reservoirs but would be vastly better secured by the reservoirs and that they would also add many other advantages and make the river a great national blessing—when we consider all these plainly apparent facts, we cannot for a moment doubt the wisdom or shrink from the heroism of the reservoir system.

My first suggestion is to "despise not the day of small things". The reservoir system can, and should, be supported by individual effort in a number of ways. Tree planting, deep tillage, tile draining, and scientific modification of the contour of cultivated fields so as to retain the wash will not only form a most sensible and efficient foundation for the reservoir system but will at the same time add to the bank account and general happiness of the small farmer and the rancher living along the head waters of the numerous tributaries of the Mississippi. Undoubtedly it would be good statesmanship for the state and the nation to offer sufficient bounties also for the construction of small reservoirs until, at least, the idea begins to take root.

Going a step higher, cities should be taught not to overlook opportunities in this direction. As an example in point the town of Hettinger, North Dakota is blessed with a beautiful sheet of water, the property of the Chicago, Milwaukee and Puget Sound Railway Company, for which I dare say the town would pay the initial cost rather than lose it. Following up this idea still further I suggest that the government, while using its own steam shovels energetically on the largest undertakings, should also offer bounties on state-construction reservoirs of smaller dimensions dependent, perhaps, on the states, offering bounties to municipal corporations and individuals for the construction of still smaller reservoirs.

The building of all these reservoirs should, of course, be under government inspection and their management afterward under government control, which leads us into a most fascinating contemplation of the possibilities of efficiency. You state in your November editorial that the weaknesses of the reservoir system are still unknown. It is my humble opinion that they never will be known. However, we cannot blink the fact that the reservoir system has one tremendous possibility of danger, a danger, however, which may, and must, be amply provided against. The danger referred to is, of course, that of a break in an upper reservoir and the successive breaking of reservoirs below. All reservoirs of any size must be made earthquake proof and the various

reservoirs should be scientifically planned as regards to size, distance apart, etc., and should all be supplied with ample gates for the speedy handling of an emergency. Now comes in the beauties of government management. Suppose a reservoir on one of the tributaries of the Missouri should break or show signs of breaking. Instantly all reservoirs below it to the very mouth of the Mississippi if necessary are opened while at the same time all other reservoirs in the system, so far as existing conditions will allow, are closed. This condition continues until the danger is reported past when the normal position of gates in the entire system is again assumed. Other possibilities suggest themselves. Suppose the lower course of the Mississippi is to be straightened. A small canal has been cut and a made-to-order flood is desired to help in the work! The time is set! Everybody turns out for a holiday! The flood arrives on schedule time! The work is done!

Neither space nor the intelligence of your readers will allow me to speak of the many advantages which will surely attend the control of the Mississippi. Suffice it to say that, labor ever so industriously as we may, none of us will ever live fully to appreciate all those advantages. This generation will have either the fame or the shame, the fame if we heroically embrace this magnificent opportunity, the shame if we neglect it.

Very truly yours,
N. J. Noble.

One Cent Letter Postage by July 1st, 1913

One cent letter postage promises to be the next live issue effecting the post office department at Washington, according to Senator Theodore E. Burton of Ohio who is leading the campaign to secure a lower letter rate.

A new one cent letter postage bill has been introduced by Senator Burton in the senate and Rep. John W. Weeks in the house, and active steps are being taken to promote its passage. The bill provides for a one cent rate by July 1 of this year.

"Without doubt the time has arrived when the people of the United States are entitled to one cent letter postage" declares Senator Burton. "The present two cent rate has been in existance since 1883, and no important changes have been made since that date, despite the fact that the population of the country has increased immensely, and there has been an astonishing increase in the amount of letter communications between our people.

"The most important reason why citizens of the United States are entitled to one cent letter postage is the fact that although we are charged two cents each for the carriage of letters, it actually costs only about a cent a piece for the government to handle them. This results in the accumulation of a surplus of over $62,000,000 each year on first class letter mail.

"The post office department was never intended to be other than self-supporting. The government is entitled to sufficient compensation for the actual cost involved in carrying first class postage, but any rate which rolls up so enormous a surplus, is nothing less than a tax upon the users of postage stamps throughout this great country.

"In 1843, the rate of postage on a letter weighing one-half ounce or a fraction thereof, carried from the city of New York to Buffalo, a distance of less than 500 miles, was twenty-five cents. On October 1, 1883, the two cent rate became operative on letters weighing half an ounce or a fraction thereof. This rate, with slight changes, has existed for thirty years.

"In the meantime, the correspondence of the country has increased enormously and transportation facilities have improved in proportion. There is no question but that the government can carry letters for less than one cent, and make a profit."

Improvements at the Bucyrus Plant.

The Bucyrus Company are adding a new building to their already large manufacturing establishment at South Milwaukee.

The new structure will be 94 ft. wide by 280 ft. long, having a main aisle 60 ft. wide served by a Pawling & Harnischfeger 15 ton traveling electric crane running the whole length of this aisle.

The side aisle on the north side of the structure will be 34 ft. wide and will be served by a traveling gantry electric crane.

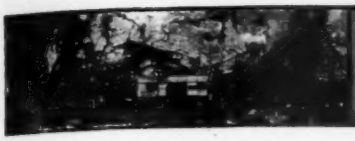
The building is to be used for structural steel work in connection with the manufacture of steam shovels, dredges, drag lines, pile drivers and wrecking cranes made by this concern.

The rooms in this building will be unusually light, as a very large percentage of the north wall will be of steel sash of the Trussed Concrete Steel Company's design. The north and west walls will be of brick while the south and east will be of corrugated iron to provide for further extension of this structure.

To the south of the building will be a storage yard 120 ft. wide by 400 ft. long in which area all of the structural material used will be stored. This area will be served by a traveling gantry crane of 15 tons capacity

The erection of the steel structure, which is being supplied by Worden & Allen of Milwaukee, is finished, and the roof and side walls are practically done. The work is being rushed on the addition so that it will be in commission in the early spring, probably the latter part of March or the first part of April.

The equipment of the new plant will be the most modern of its kind, and will greatly facilitate the delivery of machines, orders for which are crowding the works to its full capacity and, at the present time, requiring night work.



Field Notes

Braking a Shovel Down Heavy Grades.

In commenting on the note in our January issue describing a simple brake for bringing a shovel down a steep grade, a veteran shovel man states that he has often come across propositions where it was necessary to swing in the jack arms in order to clear rocks, stumps and other obstacles hence he considers it is better as a general rule to chain the timbers or drags to the rear of the shovel instead of to the jack arms.

Another Method of Helping a Shovel Climb.

In our October issue we published a suggestion for pulling a shovel ahead when off the track or when climbing a heavy grade. We suggested that a rope or chain be attached to the propelling chain and the other end made fast to a tie ahead of the shovel. An old shovel man advises us that when an old cable or chain is procurable a more powerful and effective way is to tie one end to a dead-man, stump or other obstacle ahead of the machine, and to wrap the other around the rear axle of the front truck. The shaft will thus act as a drum, whose small diameter will give a very powerful pull. The tractive force of the wheels is also better retained.

A Safe Way to Lower Dipper Sticks.

In commenting on the method of lowering the dipper sticks described in the August issue of the Steam Shovel News, Mr. E. T. King states that care must be taken not to let the dipper slip and swing in towards the shovel. In our description the end of the hoisting chain is made fast to the stick. The dipper is lowered on a flat-car and the shovel is backed away until the end of the handle is clear of the saddle block.

All the pull of course is backwards. Should the dipper slip, which it is very apt to do, it will come back like a shot out of a gun and is likely to injure anyone seriously who is in the way. Mr. King suggests that a safer way to proceed is as follows: When the dipper has been lowered on the car, be sure that the line of the dipper is up against a firm support such as a cleat or a block of wood, fastened to the car by heavy spikes, then catch the sticks with the padlock or the end of the hoisting chain at the end of the dead wood. This will hold the dipper and prevent it from slipping when the shovel backs.

A Simple Method of Replacing Broken U-Bolt.

In our October issue we described a simple method of putting a new U-bolt through the saddle block or yoke which is said to save a lot of unnecessary labor. This method in short is to put eye-bolts in the ends of the U-bolt, attach the two ends of a whistle chord thereto after lowering them through the holes in the saddle block, and then hoist away. Mr. E. T. King suggests a still simpler method, one which may be done in much less time.

First shove the slide plate along the dipper handle out of the way. If the yoke or saddle block has fallen to the ground, hoist it up by rope and set it on the gears. Drop the new U-bolt over the shaft, then take a 2x6 inch timber about 10 feet long and put it over the engines and under the shaft. With a chain hook, pull the U-bolt around the shaft until the ends stick up, meanwhile put a man on the upper end of the timber and hold the U-bolt in place. Then pick up the yoke and slide plate and drop them over the U-bolt, this will require two or three men, the pit crew and cranesman may be called up. If the threads on the U-bolt have not been injured this operation should take but 20 to 30 minutes.

How to Clean Cinders From the Front End of a Steam Shovel Boiler.

In the August issue of the Steam Shovel News, Mr. A. O. Sisson gives a clever method of keeping the front end of steam shovel boilers free from cinders in an automatic manner. Briefly this is accomplished by piping the exhaust from the swing engines into the bottom of the front end of the boiler and then up inside the boiler until the end of the pipe is the same height as the exhaust nozzle of the hoisting engines. In this pipe two holes are drilled through which the swing engine exhaust escapes, when the shovel is in operation this effectively catches up the cinders and forces them out of the stack.

Mr. E. T. King suggests another method which has given excellent results. The pump line is tapped, and a ½ inch pipe is run to the bottom of the front end of the boiler. A two inch sleeve is fitted to the end of this. At the end of this sleeve is a nipple over which is put a cap which is drilled full of holes, this sleeve should just stick through the bottom of the boiler. In this way live steam instead of exhaust is used. It is controlled by a quarter or globe valve. With this arrangement, twice a day, at noon and in the evening, is sufficient to keep the front end clean. Care must be taken, however, not to start fires about the shovel, some damage has been done this way in the past.

On modern shovels the hopper is so arranged that cinders can be got rid of with little difficulty, so that the above is not necessary except on the older type machines.

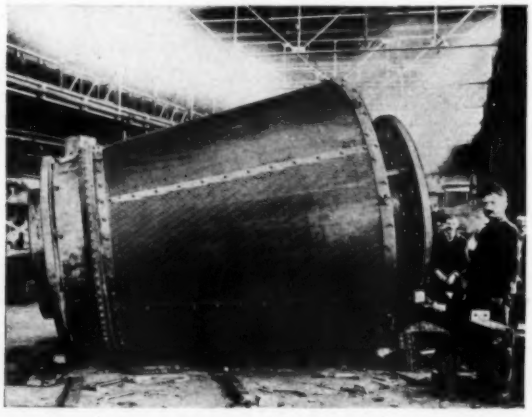
Modern Development in Sand and Gravel Washing Plant Design.

The U. S. Geological Survey recently issued a bulletin wherein they published a table which indicated the enormous increase in sand and gravel production from 1902 to 1910. In the former year 1,847,901 tons were produced while in 1910 this figure was increased to 69,410,436 tons. This tremendous growth which is accounted for by the more extensive use of sand and gravel in concrete construction work, has naturally resulted in improvements in the methods and machinery for producing this material. Crushing and excavating machinery have of course had a phenominal development. Washing and screening plants have, however, been a little slower—but today they are joining the other lines in the march of progress.

For many years the "custom-made" plant, the one designed after thorough study of the conditions involved, was a rare thing. The Webster Manufacturing Company of Tiffin, Ohio, may be fairly credited as amoung the first to recognize the fact that the standardized plant is not a wise investment. Consequently they are offering their services as expert designers and manufacturers of plants which fit each individual proposition. Their success in this line has been phenominal.

This Company has recently put on the market a new type of screen, the CYL-CONE. As its name indicates, this screen is a combination of cylindrical and conical portions. It is claimed of it that it greatly reduces the costs of installation, equipment and operation.

In the preparation of sand and gravel for the market there are three fundamental operations,



Part of a "Cyl-Cone" Screen Ready for Shipment

A Typical Webster Gravel Washing Plant

neglect of any one of which will render the material unmarketable.

1. The foreign matter in the material must be reduced to solution in the water.

2. The material must be separated into marketable sizes, the dirt laden water necessarily passing with the finest sand.

3. The sand must be separated from the dirty water.

The Cyl-cone screen accomplishes the first two of these operations more thoroughly than is possible by any other method.

The third operation is effected by means of a settling tank, several types of which have proved themselves entirely satisfactory.

It is poor economy to cut down the water supply. Whether the material needs washing or not, the presence of the proper amount of water in the screening will increase the capacity of the screens 50 per cent.

The following are the chief advantages of this screen:—

1. It is adaptable to all materials and will make any desired separations.

2. It brings the tops of all bins to the same level.

3. It permits the building of a plant of large capacity with bin tops not more than 35 or 40 feet above the ground and at the same time the material does not have to be elevated to a height of more than 45 or 50 feet.

4. It enables a saving of ⅓ to ½ in lumber required for the bins and in erecting cost.

5. It reduces by at least ⅓ the height to which the water must be pumped and hence the costly elevating and conveying machinery, and effects a like reduction in power comsumption.

6. Considerably less water is required for washing.

7. As the Cyl-cone screen is a single unit, it eliminates about ¾ the driving machinery ordinarily required.

We illustrate here a typical Cyl-cone screen. This particular screen is designed to make but three grades of material, it may be adapted to make anything from three to seven or eight separations without altering the principles of design or construction. The illustration shows the method of construction. The annular driving sprocket around the small end of the cone, and the supporting rims, one on each end, to roll on the trunnion wheels. The cone always surrounds the cylinder at the upper or securing end, catching and rescreening the sand and fine gravel.

It will be noted that the center shaft is dispensed with, thus leaving the interior open throughout.

The screen proportions and arrangement vary with the materials to be handled and the separations to be made. While the possible variations are many we give below for purpose of illustration, three typical conditions, with dicsriptions of how the Cyl-cone screen may be adapted to each.

1. Normal materials found in the general run of gravel plants, containing average amounts of dirt and loam, fully combined.

2. When materials are exceptionally dirty, containing seemingly prohibitive quantities of mud, clay, loam and other impurities.

3. Exceptionally clean material containing little dirt or loam.

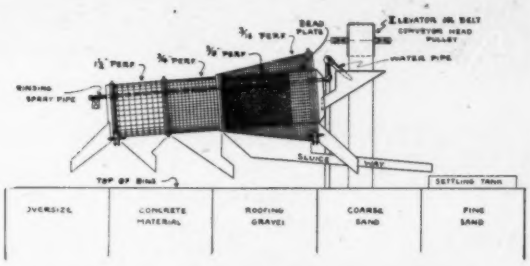
We illustrate here in outline the arrangement of a normal Cyl-cone plant.

A large pipe furnishes the washing water, while a smaller pipe, passing through the interior of the screen and having small holes along its under side, sprays clean rinsing water over as much of the material as desired.

The material as received is elevated to the top of the plant by a belt conveyor or bucket elevator and is fed, together with a stream of water, into the upper end of the screen through the charging spout here shown.

Falling first onto the dead plate, the mud and loam are given an oppertunity to enter into partial solution in the water before reaching the ⅜-in. screen.

In the ⅜-in. screen, the material under ⅜-in., together with the dirty water, passes through onto the 1/16-in. conical screen. The material between 1/16-in. and ⅜-in. is discharged from the large end of the conical screen into the coarse sand bin, while the fine sand, together with the dirty water, is discharged into a sluice, which carries it to the settling tank over the fine sand bin.



Showing Various Screen Perforators and Method of Distributing the Washed Material

The gravel rejected from the ⅜-in. screen passes on to the ¾-in. and 1½-in. screens, which successively separate and discharge the ¾-in. and 1½-in. materials to their respective bins and permit the oversize to be discharged either into the last bin or to a crusher below, from which it will be elevated and rescreened.

In the second instance when the material is dirty, the severe churning and washing necessary is accomplished by lenghtening the dead plate section of the screen swivel feet and fitting it with baffle plates inside. To lift and drop the materials into the water. A spray of rinsing water is usually necessary as well as an extra large settling tank.

Thirdly, in certain fortunate instances the other extreme is found, the materials being so free from dirt and loam that the gravel requires practically no washing and the sand has only a small amount of foreign matter.

Washing water then is supplied only in quantity sufficient to insure proper passage of the materials through the screen.

The Webster Manufacturing Co., are ready to adapt their plants not only to any of these conditions but also to all degrees between the two extremes. They make a particular point of handling these jobs expeditiously, furnishing complete plans and specifications, with full lists of material, within a few days after a contract is signed. The bin structure may then be built while the machinery is coming through, and be ready for installation of the machinery when it arrives.

A competent superintendent is furnished when wanted, to direct the erection and installation of the entire plant, or of only the machinery, as desired.

Has a Good Opinion of the Excavating Engineer

Nazareth, Pa.

"I read somewhere a little jingle about "good-better-best", which comes to mind in this connection. For you have certainly made your good better and your better best. With best wishes".

Edw. H. Tait,
Supt. Phoenix Portland Cement Co.

Alabama

Ensley—Geo. Stanbury is erecting a new Bucyrus 18-B Shovel for Dunn & Lallande here.

Arizona

Crookton—C. H. Brooker recently completed the test of Clemens & Son's new Bucyrus 150-B at Pittsburg, Kansas, and is now installing a Bucyrus 40-R for Lee Moor near here.

California

According to amended articles of incorporation filed by the Central Pacific R. R. at Alturas, Calif., actual work will be started on the Modoc Northern from Sasanville to Lookout and from Klamath Falls, Ore., to Lockout by June 1.

Surveys have been completed, E. U. Leh, Chief Engineer, San Juan Portland Cement Co., San Juan, Cal., for an extension of the Central California R. R. from San Juan to Hollister. Contractors are reported to have been figuring on the grading for the extension.

The San Pedro, Los Angeles & Salt Lake R. R., E. G. Tilton, Chief Engineer, Los Angeles, Cal., has a party in the field locating a line between Riverside, Cal., and Daggett, Cal., via Cajon pass through the San Bernardino range of mountains.

Florida

Tallahassee—The Board of Trustees of the Internal Improvement Fund have awarded a contract to the National Construction Co. of Birmingham Ala., for the construction of the West Palm Beach Canal. This canal will run from Palm Beach to Lake Okeechobee, a distance of 42½ miles. It has an average width on the bottom of 75 ft. and depth of 11 ft, requiring approximately 7,100,000 cubic yards of earth and 665,000 cubic yards of rock excavation.

Foreign

Al. Lewis is in Levide, Spain, with three 60-C Bucyrus Shovels shipped to the Ebro Irrigation and Power Co.

Georgia

Tignal—C. S. Webber is operating an 18-B Bucyrus Shovel for J. T. Cogan near here.

Macon—Chas. Flynn is setting up a new Bucyrus Class 9½ drag line excavator, electrically operated. The machine is owned by the Cherokee Brick Co.

Louisiana

Gabriel—Wm Hanson is erecting a Bucyrus Class 24 drag line excavator for the Southern Dredging Co. near here.

Illinois

Granite City—Mike Conroy's Team outfit is laid up here for the spring when he plans to furnish the levee work across the river.

Oak Glen—Andy Ward has a 35 Team outfit which is idle at this point.

Nokomis—W. G. Jackson, an experienced dragline and dipper dredge operator, of this city has finished the work recently engaged upon and is now open for another engagement.

Indiana

Ft. Wayne—The Wabash Railroad Co. has awarded contract for construction of 46 miles of double track from Hugo to Peru, through Wabash, to the Hannan-Hickey Construction Co.

Rensselaer—C. H. Sternberg of Rensselaer was awarded the contract for the J. S. Romtrager Ditch on February 1st.

The main ditch is about 13 miles long, requiring an estimated excavating of 1,540,123 cu. yds. of earth, bottom width is 40 ft. to 60 ft. There are three laterals with total length of above 2½ miles, bottom width 15 to 30 ft. The contract includes the removing and replacing of five wagon and two railroad bridges. About one-half of the work will be new channel. The improvement is the deepening, widening and straightening of Iroquois River. Digging will be by floating dredge. Digging is through black dirt and clay. Contractor is to have 24 months to complete work and 120 days from date of contract to erect dredge and begin work.

Iowa

Stone City—Mr. J. V. Cox, formerally with the firm of Shuggart & Cox, has associated himself with J. H. Green & Sons of this city. They are operating a crushed stone plant.

Preston—The Kohlmann, Luck & Walker Construction Co. has two steam shovels at work on the double tracking of the Chicago, Milwaukee & St. Paul Ry. between Green Island and Browns. The work is located near Preston, Ia. They have a new outfit including a 70C Bucyrus working in a 40-ft. rock cut and a 40R Bucyrus.

Council Bluffs—The Chicago, Milwaukee & St. Paul Ry. has completed surveys for its change of line from Council Bluffs to Manilla, Ia.

Notes from Pittsburg, Kans.

By W. S. Russell

Coal stripping operations are being somewhat retarded by the unfavorable weather which has been very changeable during the past two weeks. Alternately cold, freezing and thawing which has made the ground soft and muddy but these conditions are to be expected at this time of the year. The steam shovels are able to work but the taking out of the coal by hand is more or less delayed—The demand for coal has been good and some of the stripped mines have made records for large shipments. Prices are holding up at $2.25 per ton for lnmp, $2.00 for nut, $1.50 for slack and $1.75 for mine run, F. O. B. railroad cars at the mines.

The Haynes Coal & Mining Co. of Arcadia, report a good trade during the past month. Their 90 ton Steam Shovel has worked steadily with but little delay. They have an extra good quality of coal and the J. H. Leonard Coal Co. of Kansas City are selling it as fast as the Haynes Co. can produce it.

Packard and McWilliams, who are stripping south of Mulberry have installed a new revolving crane with a drag line attachment to handle their 4 ton train cars. This machine is placed on the main ground level alongside the pit. The boom reaches over into the pit, lifts the loaded cars up onto the train track on the main ground level, then lowers the empty cars down into the pit requiring but 3 or 4 men to operate.

The C. H. Markham Coal Co. at Curranville are doing a fine business. Their 150 ton Bucyrus steam shovel works every day with no delay and very small expense for repairs. Some days the shovel gets ahead of the pit gang who are taking out the coal, owing to bad weather, but in a few days they catch up and work along together. Mr. Markham tells us he shipped over 5000 tons in January. This coal is of the best quality and meets with ready sale.

The Ellsworth Klaner Company are still operating their Marion Shovel at Midway, stripping for the Pittsburg Midway Coal Co. Their 75 ton Bucyrus Shovel, put into shallow stripping last fall for Huber & McFarland near Fuller, has been taken out as the coal did not prove to be desirable. This shovel is for sale as they have no suitable work for it. Their work is all deep stripping. This shovel has a 36 foot boom and is well adapted for shallow stripping from 8ft. to 12 ft. deep. It is in first class good working condition and will be sold at a reasonable price. Their office is 315 Globe Building, Pittsburg, Kansas.

The new 150 ton Bucyrus steam shovel recently installed by the Clemens & Son Coal Co. at their North Pittsburg field has finished digging a ditch to divert the waters of a small creek and will now be moved across the field and commence stripping the coal. This shovel is of the latest type and is working fine. C. H. Brooker is now running for the Bucyrus Company.

The J. J. Stephenson Coal Co. are operating a model 250 Marion shovel stripping dead coal on their north Pittsburg field. W. H. Stephenson has personal charge of the work. This coal is free from sulphur and is used by the Zinc Smelters. They ship from 3000 to 4000 tons per month, the stripping is from 16 ft. to 18 ft. deep, coal 3 ft. thick.

The three big 185 ton Steam Shovels and Dragline excavator recently installed by the Bucyrus Company for Smith, Scott & White, on the Weir field 2 miles east of Chicopee, are being tested out with satisfactory results. They have a capacity to handle from 270 to 300 cubic yards of earth per hour, in a box cut 23 feet deep depositing the material all on one side. Will strip 35 feet in depth of overburden in a side cut with 50 feet of coal uncovered and uncover 80 feet in width of coal in 24 feet depth of stripping. Their shovels are quick in action with a working speed of two trips per minute. They operate steadily without vibration owing to the heavy construction of truck, base and car body, which are riveted up solid instead of being bolted. These shovels carry a boom 75 feet long and dippers of 3½ cubic yards capacity.

Smith, Scott & White have a large contract for stripping with the Central Coal & Coke Co. they have erected a model plant to handle the coal, consisting of a double lift tipple, coal screens, power house, elevated water tanks, train cars, track, 2 locomotives, pumps, water pipes, electric lighting plant, etc., all of which is the finest ever put up in this field. Mr. E. P. White is in charge of their operations and A. J. Russell is Superintendent in th field, Ed. St. John, Alfred LaRue and John Elliott are running the steam shovels. The firm has also installed a steam derrick for loading the coal which is placed in the pit on top of the coal. It lifts the loaded train cars out of the pit onto the train track upon the main ground level and lowers the empty cars down in the pit. This saves the expense of maintaining and shifting several tracks in the pit and also the expense of hauling them out of the pit with a hoisting engine from a depth of from 20 to 30 feet. Smith, Scott & White have an office at No. 316 Globe Building, Pittsburg.

The Ellsworth Klaner Company are loading from 700 to 800 tons of coal per day at their tipple on the Weir coal field. They are stripping with two model 270 Marion shovels which were installed last summer. J. H. Klaner has charge of their operations with Harry Jones as Supt.

The Roy-Millner Coal Co. of Weir City are operating their new 150 ton Bucyrus steam shovel a mile south of town and are very much pleased with it. A. W. Roy is in charge of the stripping and is doing fine. The Coal is 3½ feet thick.

The Besse-Cockrill Coal Co. are stripping with a model 250 Marion shovel a mile and a half south of Weir City, on an 80 acre field Earl Cockrill is in charge of the field operations, and is a hustler when it comes to loading coal. He has a fine plant and gives it his personal attention.

Dan Miller is stripping with his 95 ton Vulcan shovel a mile south of Scammon and has made the best showing in handling his work of any in the field during the past two years. The 20 acres of overturned ground presents a series of sharp ridges about 15 feet high extending clear across the field in regular parallel lines. Very much in contrast to the old haphazard method of stripping with teams and scrapers. His 40 acre field is quite level and smooth with from 14 ft. to 15 ft. in depth of overburden. The coal is 3 feet thick. The steam shovel averages 22,000 cu. yds. of strippings per month which uncovers about 3500 tons of coal. The coal is hauled to tipple through an open cut or runway extending through the center of the field. The shovel works across this runway from one side of the field to the other back and forth, as the coal is being taken out behind it, the train cars are hauled to the tipple by cable up the runway and descend by gravity. Mr. Miller is on the field from morning till night giving it his personal attention which is one reason for his success.

The Pittsburg-Scammon-Coal Co., J. J. Stephenson, Prest., A. H. French, Sec'y., Harry Miller, Manager, are operating a model plant a mile south of Scammon on a field of 80 acres stripping with a 150 ton Bucyrus steam shovel of the latest type, having a 60 ft. boom, 2½ yard dipper and a capacity to handle 1800 cu. yds. of earth per day of 9 hours. The stripping is from 16 ft. to 20 ft. in depth, coal a little over 3 feet thick.

The coal is loaded by hand into 2 ton train cars, having from 3 to 4 tracks in the pit. The loaded cars are hauled a mile to their tipple on Frisco R. R. by a 12 ton locomotive in less than 5 minutes. The tipple is of the lift type, recently introduced here. The cars are lifted on a cage to the screen platform and dump automatically. They are then lowered to the ground track, at the rate of a car a minute, which, is a capacity to handle from 800 to 900 tons of coal per day of 8 hours. This type of tipple takes up much less room than the style in general use having a timber trestle built on a slope of about 30 degrees and is less expensive to construct and operate. The plant was completed last fall and is in full operation having a market for all the coal that can be produced. The Company's office is No. 313 Globe Building, Pittsburg.

C. D. Smith of the Smith, Scott & White Company, who lives at Memphis, Tenn., spent a week in Pittsburg looking over their coal stripping operations. He was very much pleased with the plant and saw the first car of coal loaded

E. P. White has returned from a trip to New Orleans and is now at the Stilwell Hotel.

J. A. Cordeal, agent for the Western Wheel Scraper Co., at St. Louis, was at the Stilwell Hotel four days last week. His company furnished the 2½ ton train cars of improved design to Smith, Scott & White for handling the coal from pit to tipple.

Frank Gorman the well known agent for the Excelsior Powder Co. at Kansas City was a guest at the Stilwell Hotel for a few days recently.

W. Bager, of the Bucyrus Company spent 3 or 4 days in Pittsburg, recently looking over coal stripping operations.

S. B. Wight of the Bucyrus Company is here to supervise the testing of the 3 big 185 ton steam shovels sold to Smith, Scott & White.

C. D. Smith, J. A. Cordeal, M. Corbett, W. Bager, J. G. Ralston and W. S. Russell made quite a family party at the Stilwell Hotel for several days, where they sat at the same table and said things about one another which need not be repeated.

R. H. Hutchinson and W. S. Oakford, contractors of Peoria, Ills., were guests at the Stilwell Hotel for several days last week. They are on a trip to Texas and Oregon and stopped off to look over coal stripping operations.

J. J. Stephenson is now in Texas, on his return trip from Cuba and Panama, he is expected home about the first of March.

Frank W. Pierce of Sharpville Pa. and his father, were at Pittsburg last week. They were guests of W. H. Packard at Mulberry and came to look over the coal fields.

J. N. Hodges has returned from his trip to Panama and reports having a very pleasant time. He is at the Stilwell Hotel.

The local lodge of Elks. B. P. O. E. gave a minstrel performance at the Orpheum Theatre last week. There were 8 end men and 8 ladies all blacked up and appropriately dressed. The performance was fine and the house was packed from floor to roof. The end men sang songs, danced and told jokes on the town people. The ladies sang with renewed encores and the chorus was great. Carl Cockrill did a song and dance that was, "ausgezeichnet" and Charlie Markham and M. Watson told stories that made everybody laugh.

The after piece a court trial in coon town was a corker and worthy of professional actors. The result was a handsome sum for the B. P. O. E.

Pittsburg—John Elliott and Edward St. John are running 175-B Bucyrus shovels for Scott, Smith & White.

Kentucky

Paducah—The stockholders of the Kentucky Southwestern Railway, Light & Power Co. have voted to issue $1,500,000 of bonds for the construction of its first division from Paducah southeast to Murray, Ky., about 40 miles. Work will begin in the spring.

Henderson—Work on the Government Dam 98 at this point, has been suspended on account of cold weather and rising water, only enough men remaining on the job to look after equipment that cannot be moved. Piling for the river walls of the lock chamber have been driven, and the next work will be excavation for the wall. Winter quarters have been established for the force and equipment in Green river. The Ohio River Contract Co., of Evansville, Ind., is doing the work.

Elkhorn—The Carolina, Clinchfield & Ohio laid no new line track in 1912. It will complete this year an extension of 35 miles from Dante, Va., to Elkhorn, Ky., which is now under construction.

Wickester—R. M. Spears, is operating a Bucyrus 85 C shovel for Johnson and Briggs on Railroad work near this place.

W. C. Moran is operating a 70 C Bucyrus on the same job.

Louisiana

Many—Bids are being asked by State Highway Engineer W. E. Atkinson of Louisiana for the construction of what is known as Section No. 1 of the road improvement work which recently was decided upon by the Police Jury of Sabine Parish, Many, La. This section extends from Many northeast to the Natchitoches Parish line on a line to Robeline. It comprises 11miles, and will cost approximately $20,000. It is also proposed to advertise shortly for the construction of Section No. 2, extending from Many north to the De Soto Parish line through Sodus, a distance of 20 miles.

Thibodaux—A project is being discussed for absorbing a number of drainage districts in Assumption, Lafourche and Terrebonne parishes into one large inter-parish district, embracing 1,500,000 acres, by means of a large canal to be 35 miles long and a number of cross canals, estimated to cost about half a million dollars. C. P. Gable of Donnerhill, is interested in this proposition.

Baton Rouge—Tom Poole is operating a Bucyrus class 24 dragline for the Southern Dredging Co. here. This Company is enlarging a river side levee running through this city and is

using the dragline for borrowing and placing the material. Mrs. Poole tells us that the work has been somewhat held up this month on account of high water. The illustration shows the class 24 at work building the levee.

Minnesota

International Falls—The Minnesota, Dakota & Western Railroad is preparing to start construction work in the spring on an extension of its line to Craig, the northern terminus of the Deer River logging railroad. C. S. Giles, International Falls, Minn., is Chief Engineer.

Duluth—The Roberts-Kingston Contracting Co. have closed down for the winter after a very successful season. They expect to start again about March 15th.

Duluth—Butler Bros. have at the present time ten stripping contracts on the Non range. They recently added a half million yard job to their list from the Person Mining Co.

Duluth—Thos. Higgins, railroad contractor, is looking for new work. He has just finished a job for the Canadian Northern.

Duluth—John Runquist, Duluth railroad contractor, has secured the contract to grade the twenty-three miles of road to be built by the transfer railway which will connect at Adolph, Minn., with the Duluth, Missabe & Northern. It will run through Midway township, cross the Notrhern Pacific west of Shortline Park, and enter New Duluth from the south. The line will be used for the transportation of ore from the mines to the blast furnaces of the Minnesota Steel Company. It will be completed in time for the spring shipments of 1914.

Duluth—Mr. James B. Mishler, Contractor, has placed his order for a Bucyrus 14-B. revolving shovel, and expects to make the dirt fly this summer.

Hibbing—The recent sewer job let in Hibbing, Minn., was awarded to P. McDonnell, of Duluth, who was the successful bidder on the reinforced sewer, and A. G. Osman, of Duluth, was the successful bidder on the open ditch part which will be about two miles in length, and the excavation will amount to about 141,000-yds. The sewer is a 4 foot concrete sewer.

Kansas City Notes

By M. T. Babb.

C. W. Marshall of the Marshall Construction Co. was in town the other day. Mr. Marshall is just about ready to start work on his Milwaukee contract under the Walsh Construction Co. He feels very well satisfied over the outlook and thinks his contract will be a very satisfactory one.

W. T. Murray has already moved in on the Milwaukee work and has started moving dirt. Mr. Murray has a fine new Bucyrus 70-C with which to pursue his contract; also Davenport Locomotive and Western Cars—all new. All this means a fine yardage.

L. I. Viall, Supt. for Wood Bancroft & Doty, is in the city. Their outfit is just finishing on the C. M. & St. P. and Mr. Viall will soon be in the market for new work. The outfit is composed of 4 yard cars, shovel and dinkies.

Any one desiring to get in touch with some good steam shovel or team outfits will do well to communicate with M. T. Babb, Sales Agent Western Wheeled Scraper Co., Orear-Leslie Bldg. Kansas City, Mo., a complete list of available outfits, in vicinity of Kansas City, are always on file in that office.

Tom Campbell has completed his work out of Creston, Iowa and is now at his home in Topeka, Kansas. His large team outfit is still at Lorimer, Iowa, where it is being completely over hauled before starting on his next contract.

Our friend J. B. Dorris was in the city the other day and stopped in the office long enough to order two new Western Elevating graders for his work in Southern Illinois. on the C. & E. I. R. R. Dorris is a contractor who is making good. Like all members of the contracting world he has had his set-backs but instead of these putting him down, they have served the purpose of making him work all the harder to redeem what he had lost. Today he is reaping the reward of his efforts as his work has been crowned with success.

L. J. Smith was in Chicago this week. However he has been called far west where probably he will bid on some very heavy work coming up.

The writer had a pleasant visit with Kilpatrick Bros. of Beatrice, Nebraska. This widely known firm is anticipating a very busy year. Their plans have not as yet been announced but probably the opening of spring will find their contemplated contracts under way.

Notes from New York

By S. J. Atwood

Waltz & Reece working at Nicholson Pa., on the D. L. & W. R. R. report that their work is progressing finely and only retarded by cold weather.

The Erie Railroad is still working on many contracts, among them are Eyre & Shoemaker, Philadelphia, Pa., John R. Lee of Lima, Ohio, Robt. Grace Contracting Company, New York City, T. A. Gillespee, F. R. Jones & Company, Rochester, N. Y., Miller Construction Company, Salamanca, N. Y., Paterson-Moran & Company, Lima, Ohio. Keystone Contracting Company, Union City, Pa. Work seems to be progressing steadily and successfully on all these contracts and it is expected they will finish within time limits.

MacArthur Brothers Company have just been awarded two new contracts on the Barge Canal, building power plants between Ft. Edward and Lockport, New York, work will begin at once.

Kerbaugh & Co. have closed much of their work during the extreme cold weather, and have little to report except that they will open again with full force as soon as possible.

MacArthur Brothers Co. report that they have been working very slowly on their Power Dam job in Alabama, as floods have made work impossible till at present time, things are getting back to normal condition, full force will soon be working as usual.

McMullen Contracting Company of New York City has just received a contract for two large tunnels on the Penn. R. R. one known as the East Brady tunnel 2,660 ft. long and the other the Wood Hill tunnel 2,870 ft. long, work to commence at once.

I. W. Steele & Sons, Mart, Virginia, are building an extension for the C. C. & O. R. R. being part of the main line between Charleston and Cincinnati when completed. Mr. Steele is suffering from the general shortage of labor and has been taking foreign labor from New York City.

Many contractors are reporting that they are bidding on a number of large contracts which point to active work for the coming year at least, and conditions for the eastern country look very favorable for a good hustling summer in the dirt moving line.

If George F. Owens, foreman on the Panama Canal will send his address to Atwood Employment Office, New York City as soon as possible he will hear something to his advantage.

Lyons—George Gill has resigned his position as superintendent with the Great Lakes Construction Co., in its barge canal contract at Lyons, N. Y. James Cook, chief engineer of the company, will take personal charge of the work.

Adams Basin—The Empire Engineering Corps, have about completed their contract on the Barge Canal at this point. The Bucyrus ladder dredge "Mohawk" is being dismantled..

Jackport—Larkin and Sangster are making good progress on their lock work near here. Their Bucyrus shovel has been digging rock just west of the locks.

Newburgh—The Cornwall West Point section of highway trunk No. 3, the great west shore boulevard along Palisades and through Highlands from New York City to Albany, will be built this year. Route to be followed over and past Storm King will be pratically that surveyed for old county highways No. 411, but with changes and modifications. Tunnel 1,800 ft. long, lighted by electricity, will be necessary, penetrating south slope of Storm King Mountain and without galleries opening on river side as advocated.

Newark—Dan Oberduff is with T. A. Gillespee Co. He states that their 70-C Bucyrus is excavating for a lock on the Barge Canal near here.

Mechanicsville—Richard F. Lufkin is operating one of the four Bucyrus Steam Shovels at work in this vicinity.

Notes from Winnipeg

The C. P. R. have awarded the following contracts:—

J. D. McArthur, No. 204 McArthur Building, Winnipeg, for double tracking Kemnay to Virden line, 40 miles, also for new line Snowflake west nine miles.

Foley, Welch & Stewart, No. 739 Hastings St., W .Vancouver, for double tracking lines from Virden to Regina and Glichen to Shephard, 40 miles, also new line from Weyburn to Lethbridge 145 miles, to be done jointly with Ed. Peterson of Omaha, and from Gimli to Rivertown 22 miles.

Janse Bros., of Calgary, and Boomer & Hughes, of Spokane Wash., for double tracking from Chaplin to Jarva line, 60 miles, also new lines from Milden to Express, 126 miles, Empress to Bassano, 118 miles, and Cornation north 24 miles.

The Manitoba Pressed Brick Company with Head Office in Winnipeg, purchased a 14-B Bucyrus Revolving Steam Shovel for their sand pit at Beausejour, Manitoba.

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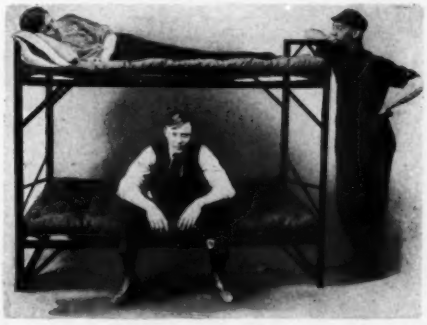

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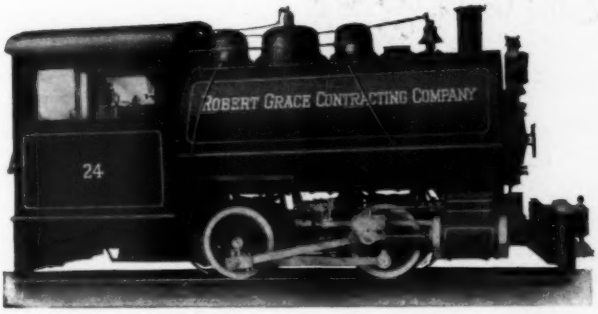

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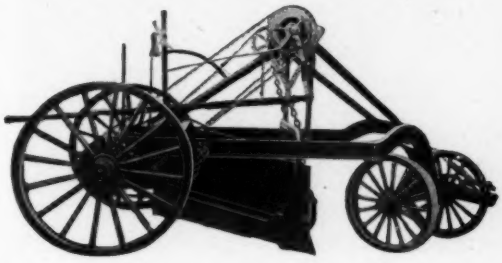

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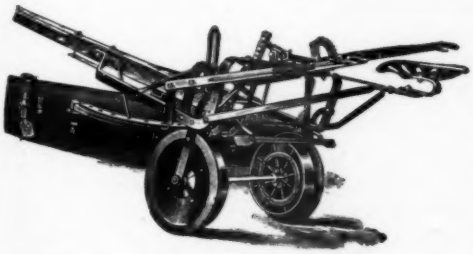

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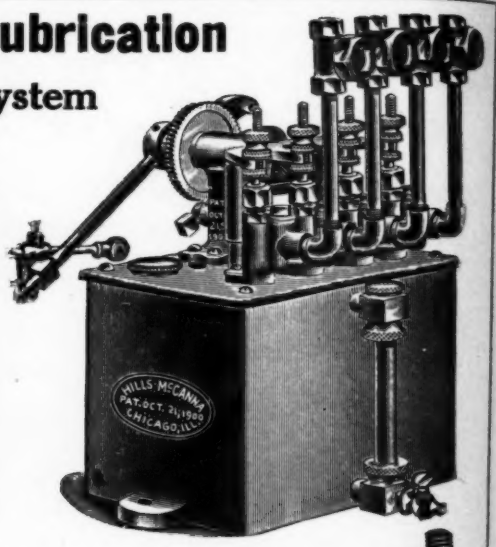
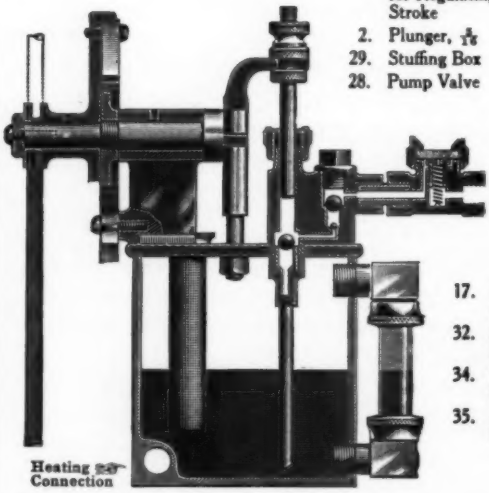


Reduces Oil Bills and Wear and Tear of Valves and Cylinders

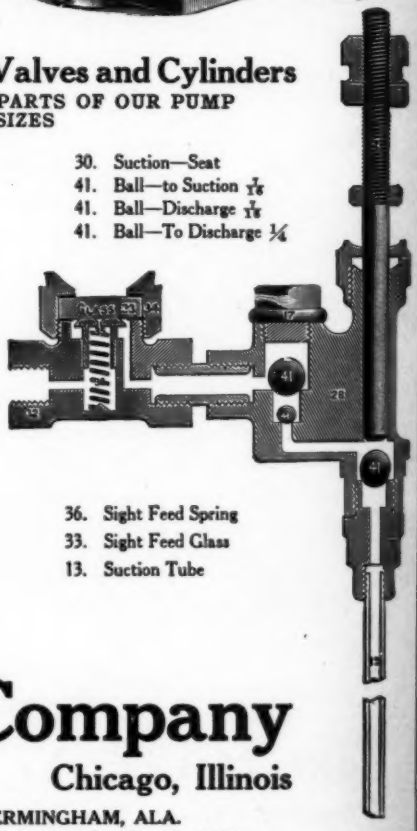
CUTS BELOW SHOW SECTIONAL VIEW OF THE PARTS OF OUR PUMP
ALL PARTS MADE TO TEMPLET SIZES

1. Plunger Button for Regulating Stroke
2. Plunger, $\frac{1}{16}$
29. Stuffing Box
28. Pump Valve



17. Pump Valve Cap
32. Sight Feed Body
34. Sight Feed Holder
35. Sight Feed Plunger

30. Suction—Seat
41. Ball—to Suction $\frac{1}{16}$
41. Ball—Discharge $\frac{1}{16}$
41. Ball—To Discharge $\frac{1}{4}$



36. Sight Feed Spring
33. Sight Feed Glass
13. Suction Tube

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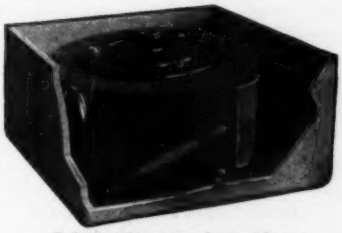

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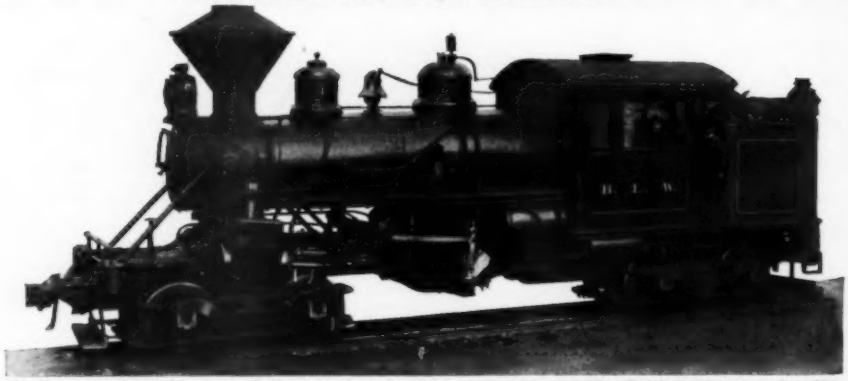

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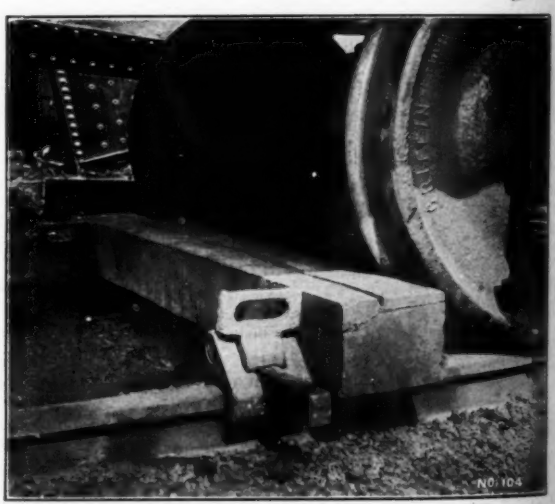

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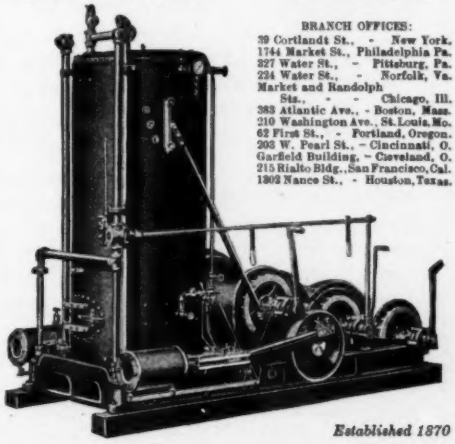

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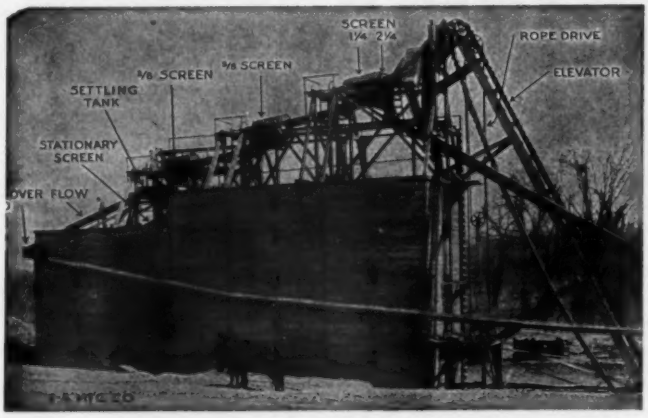

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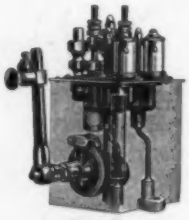

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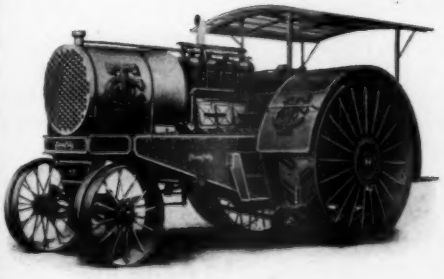

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